CLAIMS

We claim:

1. A catalyst composition with the formula:

$nN/Ce_{1-(x+y+z)}\ A_x\ A'_y\ A''_z\ O_{2-\delta}$

where A, A', A" are independently selected from the group consisting of: Zr, Gd, La, Sc, Sr, Co, Cr, Fe, Mn, V, Ti, Cu and Ni; N is one or more members of the group consisting of: Pt, Pd, and Au;

n is a weight percent between 0 and 25;

x, y and z are independently 0 to 0.9;

$x + y + z$ is 0.1 to 0.9; and

δ is a number which renders the composition charge neutral.

2. A catalyst composition of formula:

$nN/(MO_x)_y\ (CeO_{2-\delta})_{1-y}$, where

M is one or more members of the group selected from: Zr, Co, Cr, Fe, Mn, V, Ti, Ni and Cu; N is one or more members of the group selected from: Pt, Pd, and Au;

n is a weight percent between 0 and 25;

y is 0.1 to 0.9;

and x and δ make the compositions charge neutral.

3. A method for selectively removing carbon monoxide from a gas containing hydrogen comprising:

contacting said gas with a catalyst composition of claim 1 whereby the carbon monoxide in said gas is selectively removed.

4. A method for selectively removing carbon monoxide from a gas containing hydrogen comprising:

contacting said gas with a catalyst composition of claim 2 whereby the carbon monoxide in said gas is selectively removed.

5. A reactor for selectively removing carbon monoxide from a gas which comprises:
a casing having an entrance port, an exit port and a passage therebetween for the movement of said gases from said entrance port to said exit port; and
a catalyst composition of claim 1 in said passage.

6. A reactor for selectively removing carbon monoxide from a gas which comprises:
a casing having an entrance port, an exit port and a passage therebetween for the movement of said gases from said entrance port to said exit port; and
a catalyst composition of claim 2 in said passage.

7. The reactor of claim 5, wherein said gas contacts said catalyst composition before exiting said casing.

8. The reactor of claim 5, wherein said reactor is a component of a polymer electrolyte membrane fuel cell.

9. The reactor of claim 5, wherein the gas in said entrance port comprises carbon monoxide, hydrogen and oxygen.

10. The reactor of claim 5, wherein said catalyst composition is coated on a support surface.

11. The reactor of claim 5, wherein said gas in said entrance port is a fuel for a fuel cell.

12. The method of claim 3, wherein said catalyst composition contains one or more members of the group consisting of: copper, manganese and gold.

13. The method of claim 4, wherein said catalyst composition contains one or more members of the group consisting of: copper, manganese and gold.

14. The catalyst composition of claim 1, wherein said catalyst composition contains one or more members of the group consisting of: copper, manganese and gold.

15. The catalyst composition of claim 2, wherein said catalyst composition contains one or more members of the group consisting of: copper, manganese and gold.

16. The catalyst composition of claim 1 having the formula $Ce_{0.5}Cu_{0.5}O_w$, where w is a number that renders the composition change neutral.

17. The catalyst composition of claim 1 having the formula $Ce_{0.475}Zr_{0.05}Mn_{0.475}O_w$, where w is a number that renders the composition change neutral.

18. The catalyst composition of claim 1 having the formula $Ce_{0.5}Mn_{0.5}O_w$, where w is a number that renders the composition change neutral.

19. The catalyst composition of claim 1 having the formula $Ce_{0.45}Zr_{0.05}Mn_{0.45}Cu_{0.05}O_w$, where w is a number that renders the composition change neutral.

20. The catalyst composition of claim 1 having the formula $Ce_{0.5}Fe_{0.1}Cu_{0.4}O_w$, where w is a number that renders the composition change neutral.

21. The catalyst composition of claim 1 having the formula $Mn_{0.5}Fe_{0.5}O_w$, where w is a number that renders the composition change neutral.

22. The catalyst composition of claim 1 having the formula $Ce_{0.1}Mn_{0.45}Cu_{0.45}O_w$, where w is a number that renders the composition change neutral.

23. The catalyst composition of claim 1 having the formula $Ce_{0.1}Mn_{0.45}Fe_{0.55}0_{w}$, where w is a number that renders the composition change neutral.

24. The catalyst composition of claim 1 having the formula $Ce_{0.3}Mn_{0.7}O_{w}$, where w is a number that renders the composition change neutral.

25. The catalyst composition of claim 1 having the formula $Ce_{0.3}Mn_{0.65}Zr_{0.05}O_{w}$, where w is a number that renders the composition change neutral.

26. A catalyst composition for selectively removing carbon monoxide from a hydrogen-containing gas with the formula:
$Ce_{1-x}\ Mn_{b}Co_{b},O_{2-\delta}$, where $x = b + b'$, x is less than or equal to 0.95 and greater than or equal to 0.05, b and b' are, independently of one another, 0.01 to 0.9, and δ is a number which renders the composition charge neutral.

27. A catalyst composition for selectively removing carbon monoxide from a hydrogen containing gas with the formula:
$Ce_{1-x}\ Mn_{b}Zr_{c}O_{2-\delta}$, where $x = b + c$; c is less than or equal to 0.1; x is less than or equal to 0.95 and greater than or equal to 0.05; and δ is a number which renders the composition charge neutral.